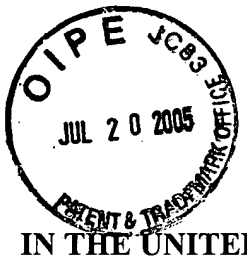

PATENT
Attorney Docket No.: 041993-5363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Confirmation No. 3545
Dong Jae YOU	)	
U.S. Parent Application No.: 10/751,477	)	Group Art Unit: 2871
Filed: January 6, 2004	)	Examiner: W. P. Chen
For: BACKLIGHT UNIT AND LIQUID CRYSTAL DISPLAY DEVICE USING THE SAME	)	**Mail Stop Amendment**

Commissioner for Patents
U.S. Patent and Trademark Office
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Randolph Building
401 Dulany Street
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Sir:

SUBMISSION OF TRANSLATION OF PRIORITY DOCUMENT

Applicant attaches hereto an English translation of Korean Patent Application No. P2003-027784 filed in Korea on April 30, 2003, to which priority is claimed in the above-identified patent application. The declaration of Mr. Hyun Churl Kim attached to the translation constitutes a statement that the translation is accurate in accordance with 37 C.F.R. § 1.55(a)(4)(ii).

Applicant believes that no fees are due in connection with the filing of this paper. However, if there are any fees due in connection with the filing of this paper, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

MORGAN, LEWIS & BOCKIUS LLP

Dated: July 20, 2005

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IN THE MATTER OF
KOREAN PATENT APPLICATION
UNDER SERIAL NO.: 27784/2003

I, THE UNDERSIGNED, HEREBY DECLARE:
THAT I AM CONVERSANT WITH BOTH THE KOREAN AND THE ENGLISH LANGUAGES: AND

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KOREAN PATENT APPLICATION UNDER
SERIAL NO.: 27784/2003

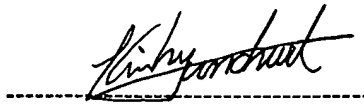
FILED ON: April 30, 2003

IN THE NAME OF: LG Philips LCD Co., Ltd.

FOR: BACKLIGHT UNIT AND LIQUID
CRYSTAL DISPLAY DEVICE THE SAME

IN WITNESS WHEREOF, I SET MY HAND HERETO

THIS 9TH DAY OF JULY 2005

BY 

KIM, HYUN CHURL

[Translation]

ABSTRACT OF THE DISCLOSURE

[Abstract]

Disclosed is a liquid crystal display device enabling to prevent the light leakage by modifying the structure of the backlight unit thereof. The present invention includes a liquid crystal display panel, a backlight unit having a fluorescent unit, a reflection sheet reflecting light emitted from the fluorescent lamp to prevent light leakage, and a bottom cover supporting the reflection sheet, and a metal chassis supporting to fix the liquid crystal display panel and the backlight unit.

[Representative drawing]

Figure 3a

[Index words]

Backlight unit, Reflection sheet, Bottom cover, Light leakage

[SPECIFICATION]

[Title of the Invention]

LIQUID CRYSTAL DISPLAY DEVICE USING THE IMPROVED BACKLIGHT UNIT

[Brief description of the Drawings]

FIG. 1 illustrates a bird's-eye view of a disassembly of a liquid crystal display device according to a related art.

FIG. 2 illustrates a bird's-eye view of a magnified cross-section of the liquid crystal display device in FIG. 1 centering around a backlight unit.

FIG. 3A illustrates a bird's-eye view of a magnified cross-section of a liquid crystal display device according to a first embodiment of the present invention centering around a backlight unit.

FIG. 3B illustrates a cross-sectional view of the liquid crystal display device shown in FIG. 3A.

FIG. 4 illustrates a bird's-eye view of a magnified cross-section of a liquid crystal display device according to a second embodiment of the present invention centering around a backlight unit.

** Explanation for the major reference numerals **

10,110,210 : liquid crystal panel	20,120,220 : backlight unit
21,121,221 : reflection plate	22,122,222 : light guide plate
23,123,223 : optical sheet	24,124,224 : mold frame
25,125,225 : bottom cover	43,143,243 : fluorescent lamp
44 : lamp cover	45,145,245 : lamp assembly
150,250 : reflection sheet	

[Detailed description of the invention]

[Object of the invention]

[Field of the invention and background art]

The present invention relates to a liquid crystal display device, and more particularly, to a liquid crystal display device including a backlight unit enabling to prevent light leakage and reduce its product cost.

Lately, a display is a very important visual information transfer medium in an information-oriented society, for which low power consumption, small/slim design, light weight, high definition, etc. are required.

Displays can be grouped into such a luminescent type as CRT (cathode ray tube), EL (electro luminescent), LED (light emitting diode), VFD (vacuum fluorescent display), FED (field emission display), PDP (plasma display panel), and the like and a non-luminescent type failing to emit light by itself.

A liquid crystal display device, which displays images using optical anisotropy of liquid crystals, has a visibility better than that of CRT, a power consumption average smaller than that of CRT having the same screen size, and an exothermic amount smaller than that of CRT. Hence, the liquid crystal display is highlighted as a next generation display together with PDP and FED.

Liquid crystals used in the liquid crystal display device are not a light-emitting material but a light-receiving material modulating incoming light to display on a screen. Hence, the liquid crystals need an extra light source, i.e., backlight unit, to irradiate light on a liquid crystal display panel.

A general liquid crystal display device is explained by referring to FIG. 1 as follows.

FIG. 1 illustrates a bird's-eye view of a disassembly of a liquid crystal display device according to a related art, and FIG. 2 illustrates a bird's-eye view of a magnified cross-section of the liquid crystal display device in FIG. 1 centering around a backlight unit.

Referring to FIG. 1 and FIG. 2, a liquid crystal display device consists of a liquid crystal display panel 10, a backlight unit 20 installed on a back of the liquid crystal display panel 10 to emit light through an entire front of the liquid crystal display panel 10, and a rectangular frame type metal chassis 30 supporting to fix each corner of the liquid crystal display panel 10 and the backlight unit 20. And, the liquid crystal display panel 10 includes

an array substrate 11, a color filter substrate 12, liquid crystals (not shown in the drawing), injected between the array and color filter substrates 11 and 12, and a driving circuit unit 13 outputting an image.

A function of the backlight unit 20 is to provide a plane light having a uniform brightness from a fluorescent lamp 43 used as a light source. And, the thickness and power consumption of the liquid crystal display device depend on how to make the thickness slim and improve a light-use efficiency.

The backlight unit 20 includes a lamp assembly 45 having the fluorescent lamp 43 therein, a reflection sheet 21 reflecting light emitted from the fluorescent lamp 43 thereon, a light guide plate 22 guiding the light, a plurality of optical sheets 23 installed on an upper surface of the light guide plate 22 to diffuse the light transferred from the light guide plate 22 as well as condense the light, a mold frame 24 sequentially stacking to receive the reflection sheet 21, light guide plate 22, optical sheets 23, and lamp assembly 45 therein, and a bottom cover 25.

The mold frame 24 is made of a plastic based material has a reception space having a predetermined depth on its top and a continuous step sill over a surface bent toward the reception space. The mold frame 24 encloses edges of the light guide plate 22 and lamp assembly 45 stacked in the reception space. And, the optical sheets 23 and liquid crystal display panel 10 are sequentially received on the step sill over the surface of the mold frame 24. Hence, the mold frame 24 enables to support the liquid crystal display device overall.

The lamp assembly 45 includes the fluorescent lamp 43 emitting light, lamp holders (not shown in the drawing) inserted in both ends of the fluorescent lamp 43 to fix thereto, a lamp cover 44 enclosing an outer circumference of the fluorescent lamp 43 to improve a light efficiency by reflecting the light emitted from the fluorescent lamp 43 toward the light guide plate 22, and wires (not shown in the drawing) transferring power to the fluorescent lamp 43.

The lamp cover 44 is generally made of a metal based material, and its inner surface is coated with Ag or covered with a separate Ag sheet or the like to perform a function of reflector. The lamp cover 44 is made of a complex-processed expensive material, thereby

increasing a product cost of the liquid crystal display device.

Moreover, a small shock or impact enables to deform the lamp cover unless the lamp cover is fully fixed thereto by the mold frame, whereby it is difficult to assemble it. Besides, light unnecessarily leaks out through a gap between the deformed portion and the optical sheet(s) or reflection sheet to affect the liquid crystal display panel, thereby degrading a quality of the liquid crystal display device. Such a gap gets bigger if another shock is impacted on the device, thereby amplifying the light leakage.

Hence, in order for the related art to prevent such light leakage, a black shield is formed along the edge of the optical sheet, which is the end of light leakage path, or a pad for cutting off the light is additionally employed.

However, the method of forming the shield on the upper diffusion sheet to prevent the light leakage makes the sheet preparing process more complicated. And, the other method of forming the pad makes the assembly process of the liquid crystal display device more complicated as well as increases the thickness of the liquid crystal display device.

[SUMMARY OF THE INVENTION]

Accordingly, the present invention is directed to a liquid crystal display device that substantially obviates one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a liquid crystal display device enabling to prevent light leakage simply without making a LCD fabrication process complicated or increased by substituting a lamp cover enclosing a lamp with a reflection sheet, overlapping the reflection sheet with a light guide plate, and making a bottom cover support the reflection sheet.

Another object of the present invention is to provide a liquid crystal display device enabling to reduce a product cost by changing a structure of a backlight unit and improving its fabrication process.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a liquid crystal display device

according to the present invention includes a liquid crystal display panel, a backlight unit having a fluorescent unit, a reflection sheet reflecting light emitted from the fluorescent lamp to prevent light leakage, and a bottom cover supporting the reflection sheet, and a metal chassis supporting to fix the liquid crystal display panel and the backlight unit.

Moreover, the backlight unit includes a panel type light guide plate having a projection plane and an incident plane, a reflection plate at a rear side of the light guide plate, a lamp assembly at the incident plane of the light guide plate, the lamp assembly including the fluorescent lamp and the reflection sheet at an outer side of fluorescent lamp, a plurality of optical sheets over the projection plane of the light guide plate, a rectangular mold frame receiving the reflection plate, light guide plate, optical sheets, and lamp assembly therein, and a bottom cover extending from a bottom of the mold frame to an outer side of the reflection sheet.

Preferably, the reflection sheet can be overlapped with the light guide plate to prevent light leakage, and the bottom cover formed of a metal-based material may leave a predetermined interval from the light guide plate for excellent assembly.

Preferably, the bottom cover has a round shape, e.g., '□', to support and fix the reflection sheet.

Importance of the role and function of a backlight unit in a liquid crystal display device is greatly emphasized nowadays. This is because the size, light efficiency, and the like in the liquid crystal display device depend on the structure of the backlight unit to affect a product cost and characteristics of the liquid crystal display device. Specifically, a portable liquid crystal display device should be thin and light as well as consume low power. For such reasons, the significance of the backlight unit has been raised.

A liquid crystal display device according to the present invention replaces an expensive lamp cover by a reflection sheet to reduce a product cost of the backlight unit and extends a reflection plate to form the reflection sheet to simplify a fabrication process thereof.

Moreover, the present invention changes a shape of a bottom cover into a round type when a lamp cover is replaced by a reflection sheet so that the reflection sheet can be

supported to fix to prevent deformation, thereby enabling to prevent light leakage.

A liquid crystal display device according to one preferred embodiment of the present invention is explained by referring to the attached drawings as follows.

FIG. 3A illustrates a bird's-eye view of a magnified cross-section of a liquid crystal display device according to a first embodiment of the present invention centering around a backlight unit and FIG. 3B illustrates a cross-sectional view of the liquid crystal display device shown in FIG. 3A.

Referring to FIG. 3A and FIG. 3B, a liquid crystal display device according to the present invention includes a liquid crystal display panel 110 outputting a video, a backlight unit 120 installed on a back of the liquid crystal display panel 110 to emit light through an entire front of the liquid crystal display panel 110, and a metal chassis (not shown in the drawing) receiving the backlight unit 120 and liquid crystal display panel 110 to fix thereto.

The backlight unit 120 includes a lamp assembly 45 having a fluorescent lamp 143 therein, a reflection plate 121 reflecting light emitted from the fluorescent lamp 143 thereon, a light guide plate 122 guiding the light, a plurality of optical sheets 123 installed on an upper surface of the light guide plate 122 to diffuse the light transferred from the light guide plate 122 as well as condense the light, a mold frame (not shown in the drawing) sequentially stacking to receive the reflection plate 121, light guide plate 122, optical sheets 123, and lamp assembly 145 therein, and a thin bottom cover 125 enclosing to support an outer side of a reflection sheet 150.

The lamp assembly 145 includes the fluorescent lamp 143 emitting light, lamp holders (not shown in the drawing) inserted in both ends of the fluorescent lamp 143 to fix thereto, and a reflection sheet 150 enclosing an outer side of the fluorescent lamp 143 to improve a light efficiency by reflecting the light emitted from the fluorescent lamp 143 toward the light guide plate 122.

A cold cathode fluorescent lamp (CCFL), which is small and exerts fluorescence of high brightness, is mainly used as the fluorescent lamp 143. In this case, a fluorescent substance of CCFL is composed of bright earth species (Y, Ce, Tb, etc.) and a 3-wavelengths

type of white generated from mixing R (red), G (green), and B (blue) fluorescent substances with each other is used for liquid crystal display. The CCFL backlight remarkably requires low power consumption and provides very bright white light.

The reflection plate 121 is prepared in a manner that a mixed material containing an acrylic binder and pigment which has no optical absorption and a high reflexibility such as TiO2, BaSO4, etc. is coated on a base material to have a gradation pattern. Namely, the mixed material is coated on the base material with the gradation pattern so that a portion closer to the fluorescent lamp 143 is coated with a pattern smaller than that of another portion distant from the fluorescent lamp 143. Hence, the reflection plate 121 reduces a loss of an incident light on the liquid crystal display panel 110 and improves a uniformity of light transmitted to a projection plane of the light guide plate 122.

The light guide plate 122 forms a panel shape having the projection plane in parallel with a tilted rear plane (otherwise, rear plane in parallel with tilted projection plane), and makes the light generated from the fluorescent lamp 143 progress toward the liquid crystal display panel 110 thereon through the projection plane of the light guide plate 122. For this, diffusion ink (not shown in the drawing) is printed like a fine dot on the rear plane of the light guide plate 122 to make the light generated from the fluorescent lamp 143 progress toward the liquid crystal display panel 110.

The optical sheet 123 leads to improve a viewing angle, a brightness of the light outputted to the projection plane of the light guide plate 122, etc.

The reflection sheet 150 is formed of synthetic resin such as ABS (alkylbenzene sulfonate), PET (polyethylene terephthalate), PVC (polyvinyl chloride), etc., or a non-metallic substance. In order to prevent the color from being changed into brown due to long-time heat absorption around the fluorescent lamp 143, Ti (titanium), polymer of high reflexibility, or the like is coated to use for the reflection sheet 150. The reflection sheet 150 encloses most portions of the fluorescent lamp 143 except a light exit portion like a round shape, e.g., '□'so as to form a round shape, and is fitted to both sides of the light guide plate 122. In this case, the reflection sheet 150 is fitted to both sides of the light guide plate 122 to

be overlapped with the light guide plate 122 in part, whereby deformation is hardly brought about. It is able to set an overlapped width B of 0.2~30mm between the reflection sheet 150 and light guide plate 122.

Instead of the related art 'L' type bottom cover, the bottom cover 125 of the present invention has the same shape of the reflection sheet 150 to prevent the deformation of the reflection sheet 150. And, the bottom cover 125 is disposed on an outer side of the reflection sheet 150 to support and fix. Hence, it is able to prevent the light leakage from occurring from a gap between the reflection sheet 150 and the optical sheet or reflection plate 123 or 121.

The bottom cover 125leaves a predetermined interval A from the light guide plate 122 so as to smooth assembly with the light guide plate 122. And, the predetermined interval A may be 0.1~50mm wide.

In the above-constructed liquid crystal display device according to the present invention, as power is supplied from an inverter, the fluorescent lamp 143 emits light. In this case, the reflection sheet 150 enclosing the fluorescent lamp 143 reflects the light emitted from the fluorescent lamp 143 toward the light guide plate 122, and the light guide plate 122 then guides the light to the liquid crystal display panel 110 to display an image.

Moreover, since the reflection sheet has the same function of the reflection plate, they can be formed of the same material. Hence, the reflection sheet can be formed by extending the reflection plate, which is implemented by the following embodiment of the present invention.

FIG. 4 illustrates a bird's-eye view of a magnified cross-section of a liquid crystal display device according to a second embodiment of the present invention centering around a backlight unit, which shows the same construction of the liquid crystal display device in FIG. 3 except the way of forming a reflection sheet.

Referring to FIG. 4, a liquid crystal display device according to another embodiment of the present invention includes a liquid crystal display panel 210 outputting a video, a backlight unit 220 installed on a back of the liquid crystal display panel 210 to emit light

through an entire front of the liquid crystal display panel 210, and a metal chassis (not shown in the drawing) receiving the backlight unit 220 and liquid crystal display panel 210 to fix thereto.

The backlight unit 220 includes a lamp assembly 245 having a fluorescent lamp 2143 therein, a reflection plate 221 reflecting light emitted from the fluorescent lamp 243 thereon, a light guide plate 222 guiding the light, a plurality of optical sheets 223 installed on an upper surface of the light guide plate 222 to diffuse the light transferred from the light guide plate 222 as well as condense the light, a mold frame (not shown in the drawing) sequentially stacking to receive the reflection plate 221, light guide plate 222, optical sheets 223, and lamp assembly 245 therein, and a thin bottom cover 225 enclosing to support an outer side of a reflection sheet 250.

In this case, the reflection sheet 150 enclosing the outer side of the fluorescent lamp 243 is formed by extending the reflection plate 221 under the light guide plate 221. Moreover, the reflection sheet 250 can be formed on the same material of the reflection plate 221.

Therefore, in the process of fabricating the backlight unit according to the embodiment of the present invention, the reflection sheet and the reflection plate are fabricated by the same step of the fabrication process to simplify the fabrication process. And, since the reflection sheet and plates are formed of the same material, a product cost of the liquid crystal display device can be reduced.

The forgoing embodiments are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

[Effect of the invention]

Accordingly, the liquid crystal display device according to the present invention simply enables to prevent the light leakage by modifying the structure of the backlight unit thereof without increasing or complicating the fabrication process. Namely, the reflection

sheet is overlapped with the light guide plate and the bottom cover brings tight contact with the reflection sheet to support and fix, whereby there exists no gap between the edge of the reflection sheet, the metal reflection plate, and the optical sheet. Thus, it is able to prevent the light leakage that the light emitted from the fluorescent lamp leaks outside without passing through the sheets. Therefore, the present invention enables to improve the quality of the liquid crystal display device.

Moreover, such a pad and the like are not required for preventing the light leakage, whereby the present invention enables to reduce the thickness of the liquid crystal display module itself.

And, the expensive lamp cover is replaced by the synthetic resin based reflection sheet having the excellent reflexibility, whereby the present invention enables to reduce the product cost.

What is claimed is:

1. A liquid crystal display device comprising:

a liquid crystal display panel;

a backlight unit having a fluorescent unit, a reflection sheet reflecting light emitted from the fluorescent lamp to prevent light leakage, and a bottom cover supporting the reflection sheet; and

a metal chassis supporting to fix the liquid crystal display panel and the backlight unit.

2. The liquid crystal display device of claim 1, the backlight unit comprising:

a panel type light guide plate having a projection plane and an incident plane;

a reflection plate at a rear side of the light guide plate;

a lamp assembly at the incident plane of the light guide plate, the lamp assembly including the fluorescent lamp and the reflection sheet at an outer side of fluorescent lamp;

a plurality of optical sheets over the projection plane of the light guide plate;

a rectangular mold frame receiving the reflection plate, light guide plate, optical sheets, and lamp assembly therein; and

a bottom cover extending from a bottom of the mold frame to an outer side of the reflection sheet.

3. The liquid crystal display device of claim 1, wherein the reflection sheet encloses an outer side of the fluorescent except a light exit of the fluorescent lamp and is overlapped with the light guide plate in part.

4. The liquid crystal display device of claim 1, wherein the reflection sheet has a round shape and portions of both ends of the reflection sheet are overlapped with the light guide plate.

5. The liquid crystal display device of claim 4, wherein the reflection sheet is overlapped with the light guide plate to a width of 0.2~30mm.

6. The liquid crystal display device of claim 1, wherein the reflection sheet is formed of a synthetic resin selected from the group consisting of ABS, PET, and PVC.

7. The liquid crystal display device of claim 6, wherein a polymer of high reflexibility or Ti is further formed inside the synthetic resin.

8. The liquid crystal display device of claim 1, wherein the reflection plate extends to form the reflection sheet.

9. The liquid crystal display device of claim 1, wherein the bottom cover has a round shape.

10. The liquid crystal display device of claim 1, wherein the bottom cover leaves an interval of 0.1~50mm from the light guide plate.